PARISHRAM 2024

- FOR 12TH CLASS CBSE BOARD STUDENTS -

- Subject Name- Mathematics
- Chapter Name- Relations and Functions

Lecture No.- 03

By- Akhil Roy Sir

Today's Targets

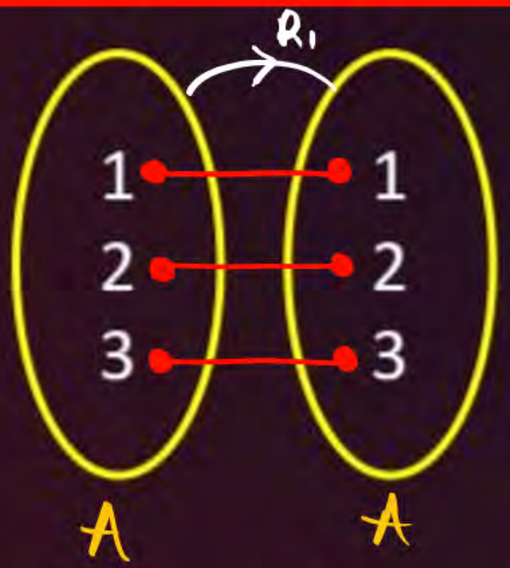
1. Types of Relations
2. ---------
3. ---------
4. ---------

Identity Relation

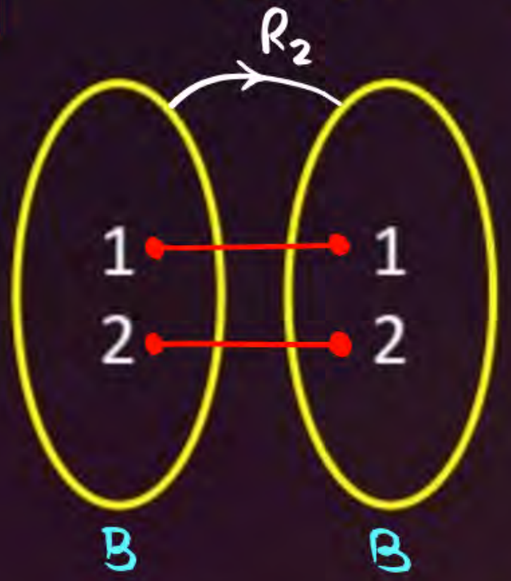
$R = \{(a, a) : \forall a \in A\}$ → for all

$R_4 = \{(1,1), (1,3), (2,2), (3,3)\}$

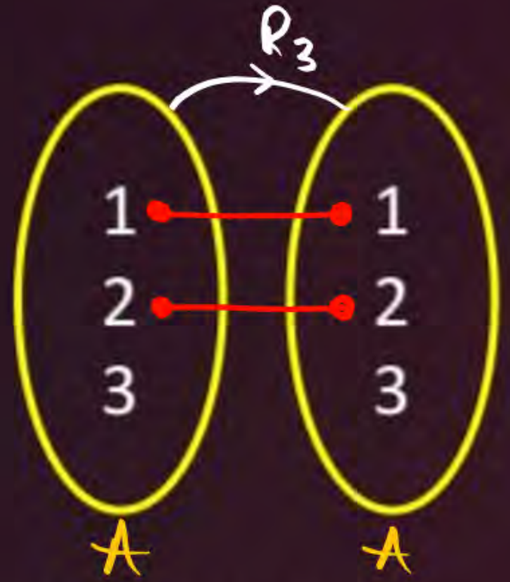
$A = \{1, 2, 3\}$ $B = \{1, 2\}$



Identity Relation ✓

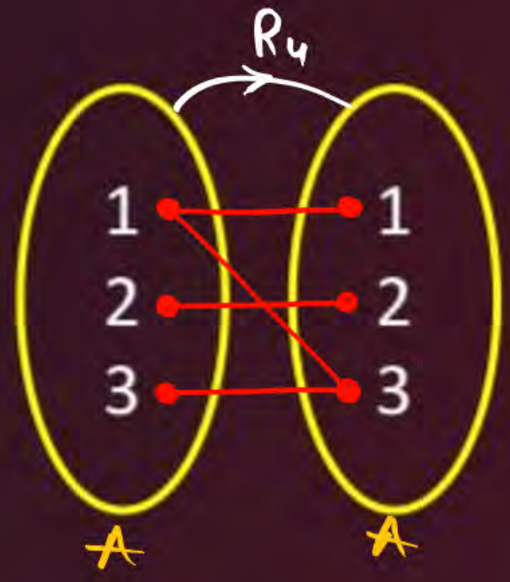


Identity Relation ✓



Not Identity Relation

qki '3' ki mapping nahi ho rahi hai!



Not Identity Relation

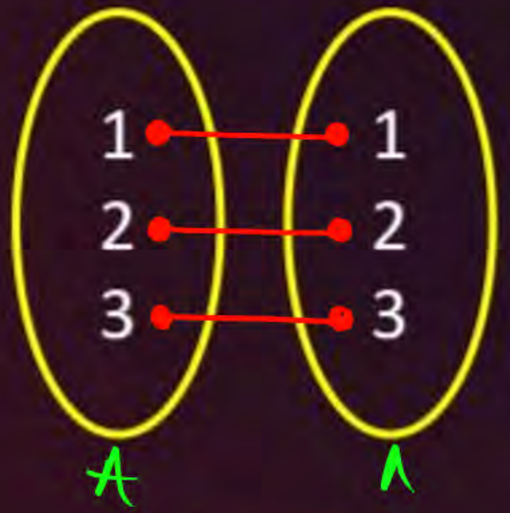
qki (1,3) ho rahi hai!

Reflexive Relation

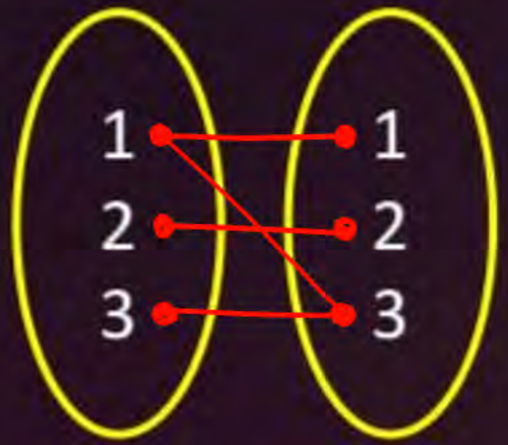
For every $a \in A$ there exists $(a, a) \in R$

Identity Relation : $R = \{(a,a) : a \in A\}$

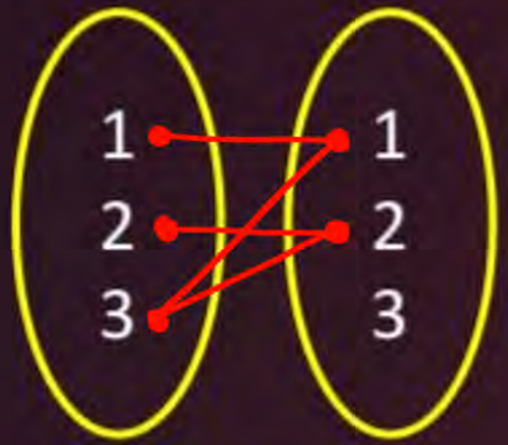
(*) Every Identity is Reflexive but every reflexive is not identity



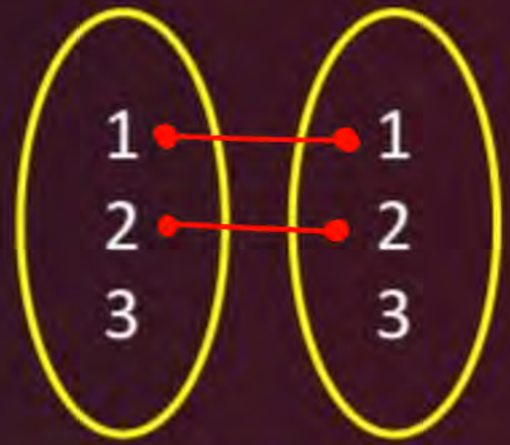
Identity ✓
Reflexive ✓



Identity ✗
Reflexive ✓



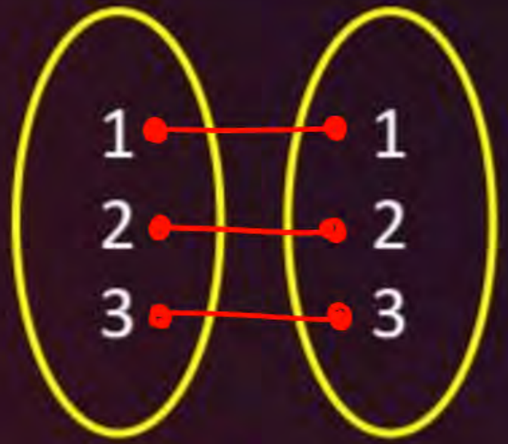
Identity ✗
Reflexive ✗



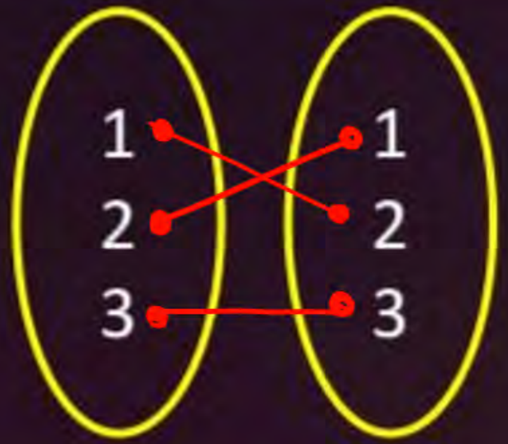
Identity ✗
Reflexive ✗

Symmetric Relation

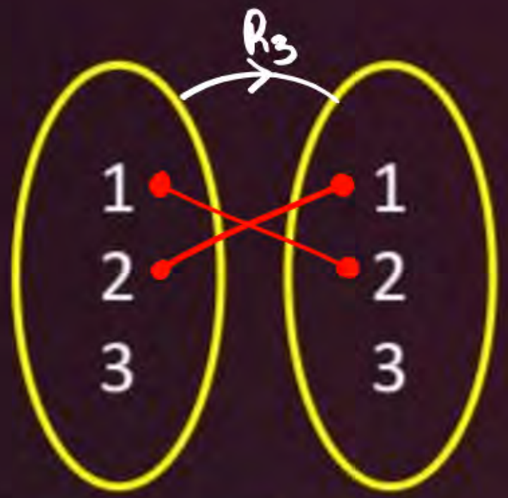
For every $(a, b) \in R$ there exists $(b, a) \in R$



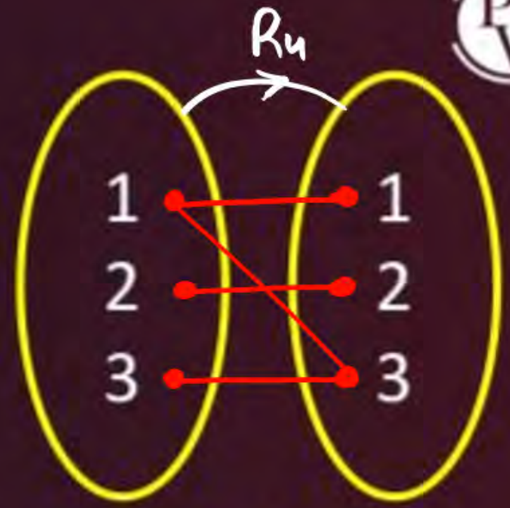
I ✓
R ✓
S ✓



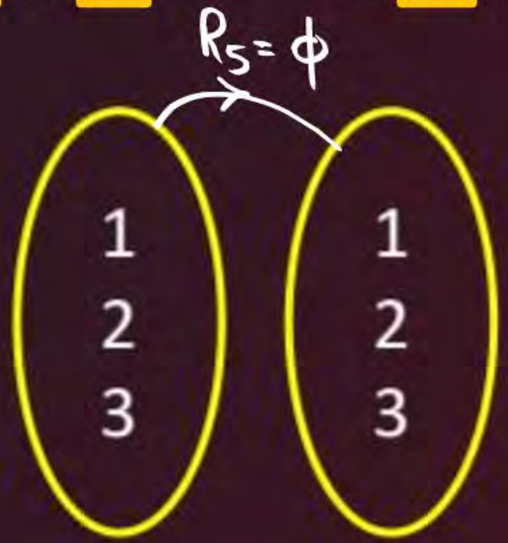
I ✗
R ✗
S ✓



I ✗ R ✗ S ✓



I ✗ R ✓ S ✗



I ✗
R ✗
S ✓

(2) Agar 2 diff elements ki mapping no ho rahi ho. To symm. check karne ki jarurat nahi!

(1) $(a,a) \in R$
$(a,a) \in R$

Transitive Relation

For $a, b, c \in A$ and $(a, b), (b, c) \in R$ implies that $(a, c) \in R$

$R_1 = \{(1,2), (2,3), (1,3)\}$ T ✓

$R_2 = \{(1,1), (2,2), (3,3)\}$ T ✓

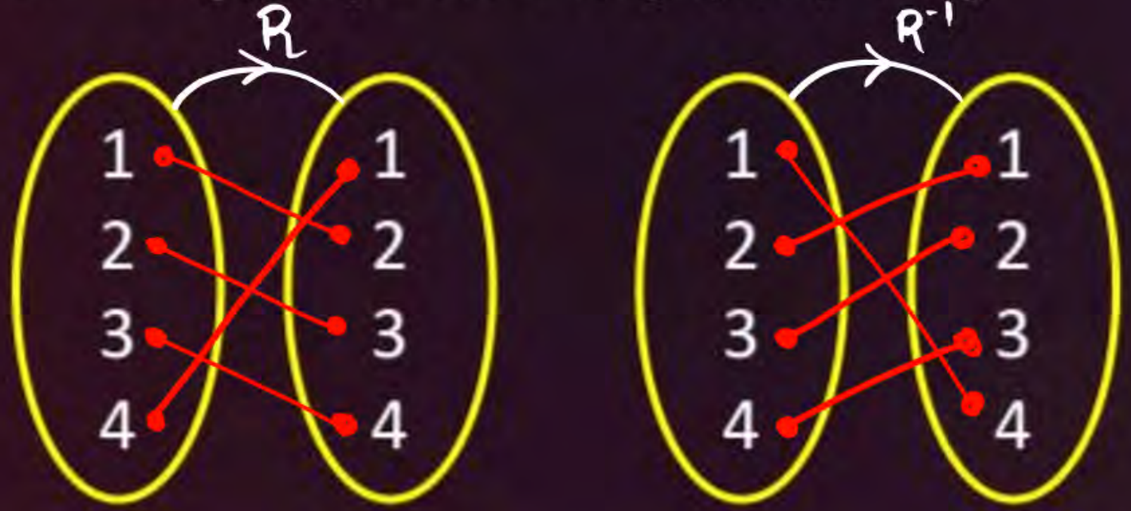
$R_3 = \{(1,2), (2,1), (1,1)\}$ T ✗ ($(2,1), (1,2) \in R$ but $(2,2) \notin R$)

$R_4 = \phi$ T ✓ (Isme T check karne ki jarurat hi nahi hai)

* Agar a se b related hai magar b se c related nahi hai! To transitive check karne ki jarurat nahi hai!

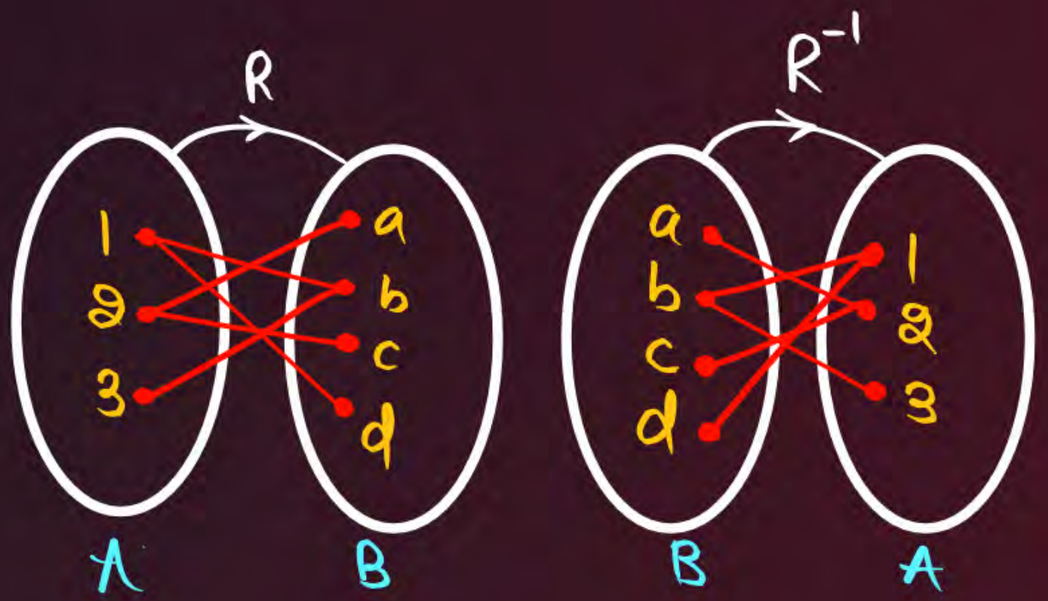
Inverse Relation

$R^{-1} = \{(b, a) : \text{for every } (a, b) \in R\}$



$R = \{(1,2), (2,3), (3,4), (4,1)\}$

$R^{-1} = \{(2,1), (3,2), (4,3), (1,4)\}$



Homework

Determine whether each of the following relations are reflexive, symmetric and transitive:

(iv) Relation R in the set **Z** of all integers defined as
$R = \{(x, y): x - y \text{ is an integer}\}$

(v) Relation R in the set A of human beings in a town at a particular time given by
(d) $R = \{(x, y): x \text{ is wife of } y\}$
(e) $R = \{(x, y): x \text{ is father of } y\}$

iv) $R = \{(x,y) : x-y \text{ is integer}\}$ $\quad R: \mathbb{Z} \to \mathbb{Z}$

$\mathbb{Z} = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$

① R ☑

$x - x = 0 \in \mathbb{Z}$

$\Rightarrow (x,x) \in R$

② S ☑

let $x \in \mathbb{Z}$, $y \in \mathbb{Z}$ $\quad (x,y) \in R$

and $x - y \in \mathbb{Z}$

$\Rightarrow y - x \in \mathbb{Z}$

$\Rightarrow (y,x) \in R$

③ T ☑

let $x \in \mathbb{Z}$, $y \in \mathbb{Z}$, $z \in \mathbb{Z}$

and $(x,y) \in R$, $(y,z) \in R$

$x - y \in \mathbb{Z}$, $y - z \in \mathbb{Z}$

$\Rightarrow (x-y) + (y-z) \in \mathbb{Z}$

$\Rightarrow x - z \in \mathbb{Z}$

$\Rightarrow (x,z) \in R$

✱ R is an equivalence relation

v) a) $R = \{(x,y) : x \text{ is wife of } y\}$

① R ✗

x is wife of x ?

(No)

② S ✗

let. x is wife of y

$\Rightarrow$ y is wife of x ?

(No)

③ T ✓

let $(x,y) \in R$ and ~~$(y,x) \in R$~~

Impossible

If x is wife of (y) → Male

then y can not be wife of x

Homework

Let R be a relation over the set $N \times N$ and it is defined by $(a, b)R(c, d) \Rightarrow a + d = b + c$. Then R is (HW)

A Symmetric only

B Transitive only

C Reflexive only

D None of these

THANK
YOU